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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/787,381	02/26/2004	Florian O. Mertens	GP-304820	4785

60770 7590 10/27/2010

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EXAMINER	
WARTALOWICZ, PAUL A	

ART UNIT	PAPER NUMBER
1735	

MAIL DATE	DELIVERY MODE
10/27/2010	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/787,381	MERTENS ET AL.	
	Examiner	Art Unit	
	PAUL A. WARTALOWICZ	1735	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 August 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-5,7,8,10-12,14,15,19-21,26-29,48,49,54,55,57,61 and 63-70* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-5,7,8,10-12,14,15,19-21,26-29,48,49,54,55,57,61 and 63-70* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Applicant's arguments filed 8/6/10 have been fully considered but they are not persuasive.

Applicant argues that Machin maintains the lithium hydride at selected temperatures and that Machin doesn't add water vapor to heat the lithium hydride crystals and promote a reaction.

However, it appears that an addition of water to the lithium hydride crystals would inherently release heat. Additionally, the starting temperature of the mixture is a feature not claimed. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., starting temperature of mixture) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). While Machin provides a process that has a high starting temperature, it appears that a reaction between water and hydride will still generate heat in the absence of a showing to the contrary.

Applicant argues that Machin does not teach a mixture of hydride and hydroxide particles for release of hydrogen on demand.

However, Machin discloses a method of providing hydrogen by reaction of lithium hydride, lithium hydroxide, and water to produce hydrogen (pg. 2208). It appears that

one of ordinary skill in the art would recognize that if more hydrogen was desired, one could supply more reactants (hydride, hydroxide, and water) to react and supply more hydrogen (on demand). Additionally, it is known to provide a device in which hydride is reacted with water to produce hydrogen on demand for a hydrogen consuming application as taught by Long (col. 2, lines 8-25; col. 4, lines 54-60). Additionally, the claim recites that the hydrogen storage device being "adapted for" release of hydrogen from the mixture. The term "adapted for" appears to recite optional language. MPEP 2111.04. However, the claim amendment requires transferring hydrogen from the hydrogen storage device to a hydrogen consuming application rather than providing an optional limitation of intended use. This interpretation appears to be valid as the claim recites "hydrogen being delivered from the hydrogen storage device to the hydrogen consuming application" at line 14. It appears that the combined prior art of Machin in view of Long teaches this limitation.

Applicant argues that Machin teaches away from applicant's claimed method as Machin states that the production of lithium oxide from lithium hydride and lithium hydroxide is negligible over the range of temperatures used in the process (i.e. <120°C).

However, Machin teaches that this reaction (lithium hydride and lithium hydroxide producing lithium oxide and hydrogen) takes place at temperatures above 120°C (pg 2216). Additionally, it appears that additional hydrogen can be produced by a reaction between additional hydride and hydroxide in the presence of a temperature above

120°C. One of ordinary skill in the art would recognize that raising the temperature of the mixture to above 120°C would produce hydrogen from the byproduct composition lithium hydroxide as delineated by reaction 22 at page 2216.

Applicant argues that Machin does not teach preparation and storage of a mixture of hydride and hydroxide particles so that the total amount of hydride particles reacts substantially completely with water and particles of hydroxide to form hydrogen and an oxide.

However, one of ordinary skill in the art would be able to provide a mixture of hydride and hydroxide particles so that particles of hydride reacts substantially completely with water and particles of hydroxide to form hydrogen and an oxide as Machin teaches that water reacts substantially with hydride to produce hydroxide (pg. 2208) and that hydride reacts with hydroxide at temperatures above 120°C (pg. 2216). The ratios of starting materials are set forth by the reaction equations in Machin at page 2208 and 2216 such that one of skill of ordinary skill in the art would know the amount of starting materials to add to ensure substantial reaction between the reactants. Additionally, the claims recite a method comprising "preparing a mixture of particles of hydride and a hydroxide" but do not specify how the mixture is prepared. This recitation appears to be open to mixing hydride with water to produce hydroxide particles which is taught by Machin at page 2208. Additionally, the claim recites preparing a mixture of hydride particles and hydroxide particles and then placing the mixture into a hydrogen storage device. While Machin teaches placing water and hydride in the hydrogen

generating device and then preparing a mixture of hydride and hydroxide particles, selection of any order of performing process steps is prima facie obvious in the absence of new or unexpected results. MPEP 2144.04 (IV) (C).

Applicant argues that the Amendola disclosure is unrelated to both the Machin disclosure and applicants' claimed methods. However, it appears that the Amendola reference is relevant to Machin in that both the Machin reference and the Amendola reference are drawn to producing hydrogen from metal hydrides.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1, 3-5, 7, 8, 10-12, 14, 15, 19-21, 26-29, 48, 49, 54, 55, 57, 61, 63-70 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The recitation in claim 1 of "the sole residue material in the hydrogen storage device" renders the claim indefinite. It does not appear that applicant's specification lends support to the oxide being in the form of a residue. It is requested that applicant point out the part of the specification that lends support to these recitations. Additionally, it appears that the recitation at claim 1, lines 3-5 and claim 67,

lines 3-5 of "preparing a mixture of particles...and placing the prepared mixture...in a hydrogen storage device" does not appear to have support in the specification. Example 1 recites placing both lithium hydroxide and lithium hydride into a container but does not teach preparing a mixture of hydride and hydroxide particles, and subsequently placing the mixture in a hydrogen storage device. Additionally, the recitation in claim 67, line 6 of "hydrogen storage device in proximity to the hydrogen consuming application" does not appear to have support in the specification.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1, 3-5, 7, 8, 10-12, 14, 19-21, 26-29, 54-55, 57, 63, 67-70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Machin et al. ("Kinetics of the

Reaction of Water Vapour with Crystalline Lithium Hydride") in view of Long (US 5702491).

Machin et al. teach a method for producing hydrogen (page 2205) wherein lithium hydroxide hydrate is reacted with lithium hydride in particle form (page 2206) in the presence of water to produce hydrogen (page 2217). Machin additionally teaches that the process of reacting lithium hydride and water takes place in an apparatus (pg 2207) which appears to meet the limitation of a hydrogen storage device in claim 1 as the claim does not recite a particular structure of the hydrogen storage device.

Machin fails to teach delivering the hydrogen produced to a hydrogen consuming application on demand.

Long, however, teaches a method of producing hydrogen (col. 1, lines 5-10) wherein it is known to provide hydrogen produced from hydrolyzation of lithium hydride to a fuel cell (col. 2, lines 8-25; col. 4, lines 54-60).

Therefore, it would have been obvious to one of ordinary skill in the art at the time applicant's invention was made to provide the hydrogen produced in the process of Machin delivered from the hydrogen storage device to a fuel cell (hydrogen consuming application) as taught by Long.

Regarding the limitation of preparing a mixture of hydride particles and hydroxide particles and then placing the mixture into a hydrogen storage device; Machin does not teach preparing a mixture of hydride particles and hydroxide particles and then placing the mixture into a hydrogen storage device. While Machin teaches placing water and hydride in the hydrogen generating device and then preparing a mixture of hydride and

hydroxide particles, selection of any order of performing process steps is prima facie obvious in the absence of new or unexpected results. MPEP 2144.04 (IV) (C).

It appears that Machin et al. teach water, lithium hydroxide, and lithium hydride are present in quantities such that the reaction of the reactions would be inherently taught including production of heat by the reaction of lithium hydride and water.

Regarding the limitation of producing oxide as substantially the sole byproduct, one of ordinary skill in the art would recognize that the amount of hydride and water needed to completely react the hydride with water and hydroxide is clearly delineated by reactions (i), (ii), (24), (22), inter alia (pp 2208, 2216, 2217). Additionally, Machin teaches that additional hydrogen can be produced by a reaction between additional hydride and hydroxide in the presence of a temperature above 120°C (pg 2216). Therefore, it would have been obvious to one of ordinary skill in the art would raise the temperature of the mixture to above 120°C and provide reactants in a stoichiometric amount in Machin in order to produce additional hydrogen and lithium oxide from the intermediate byproduct composition lithium hydroxide and lithium hydride. Additionally, it appears that the lithium oxide byproduct produced would meet the limitation of being residue as required by claim 1 in the absence of a showing to the contrary.

Regarding the limitation in claims 1 and 67 in the preamble that the method is "for release of hydrogen upon demand; and, upon a demand for hydrogen from the mixture" appears to be intended use and does not limit the claim. In response to applicant's argument that the prior art does not teach a method for release of hydrogen upon demand; and, upon a demand for hydrogen from the mixture, a recitation of the

intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. Additionally, Machin discloses a method of providing hydrogen by reaction of lithium hydride, lithium hydroxide, and water to produce hydrogen (pg. 2208). It appears that one of ordinary skill in the art would recognize that if more hydrogen was desired, one could supply more reactants (hydride and water) to react and supply more hydrogen. Additionally, it is known to provide a device in which hydride is reacted with water to produce hydrogen on demand as taught by Long (col. 2, lines 8-25).

Regarding claims 1 and 67, it appears that the reaction between lithium hydride and water of the prior art is substantially similar to that of the claimed invention such that a similar amount of heat would be produced by each of the reactions in the absence of a showing to the contrary.

Regarding the limitation in claims 1 and 67 of preparing a mixture of particles of hydride and hydroxide; as the reaction of Machin progresses, lithium hydroxide hydride is formed such that a reaction between LiH and lithium hydroxide hydrate takes place in the presence of a large dose of water to produce hydroxide and hydrogen (page 2207, 2217). The hydroxide can then react with remaining hydride to produce lithium oxide and more hydrogen (page 2207, 2216, reaction 22). Additionally, it appears that some dependent claims require this feature (claim 3, for example).

Regarding the limitation in claim 67 of the hydrogen storage device in proximity to the hydrogen consuming application, it appears that proximity encompasses a broad range of distances such that any distance contemplated by the combined prior art meets this limitation.

Additionally, it appears that Machin et al. teach that LiH reacts with both LiOH and $LiOH \cdot H_2O$ (page 2216, 2217) such that claims 20, 21, 57, 74-76, 84 are taught by Machin.

Claims 15, 48, 49, 61, 64-66 are rejected under 35 U.S.C. 103(a) as being unpatentable over Machin et al. ("Kinetics of the Reaction of Water Vapour with Crystalline Lithium Hydride") in view of Long (US 5702491) in further view of Amendola et al. (U.S. 2004/0033194).

Machin and Long teach a process as taught above in claim 1, but fail to teach lithium borohydride as the hydride used in the hydrogen generating process.

Amendola et al., however, teach a method for hydrogen generation [0024] comprising lithium borohydride [0030] for the purpose of providing useful hydrogen generation systems [0026].

Therefore, it would have been obvious to one of ordinary skill in the art at the time applicant's invention was made to provide lithium borohydride [0030] in Machin and Long in order to provide useful hydrogen generation systems [0026] as taught by Amendola et al.

Regarding claims 65, 65, and 88, it appears that Machin et al. teach that LiH reacts with both LiOH and $LiOH \cdot H_2O$ (pg. 2208, pg. 2217).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to PAUL A. WARTALOWICZ whose telephone number is (571)272-5957. The examiner can normally be reached on 8:30-6 M-Th and 8:30-5 on Alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jessica L. Ward can be reached on (571) 272-1223. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Paul Wartalowicz
October 21, 2010

/Jessica L. Ward/
Supervisory Patent Examiner, Art Unit 1735